SOUTHEAST CHP INITIATIVE

Joel Anderson

BCHP Initiative Chair

Sr. VP Mississippi Valley Gas

Building The Best Energy System For Our Nation

Cooling, Heating and Power

CHP is the Best!

- **More efficient use of Primary Energy**
  - **Reduce reliance on imports**
  - **Improve ability to compete**
- **Reduce dependence on electric grid**
  - **95% of outages caused by distribution system failures**
  - **Aging infrastructure of electric facilities**
  - **Reduce peak electric demand**

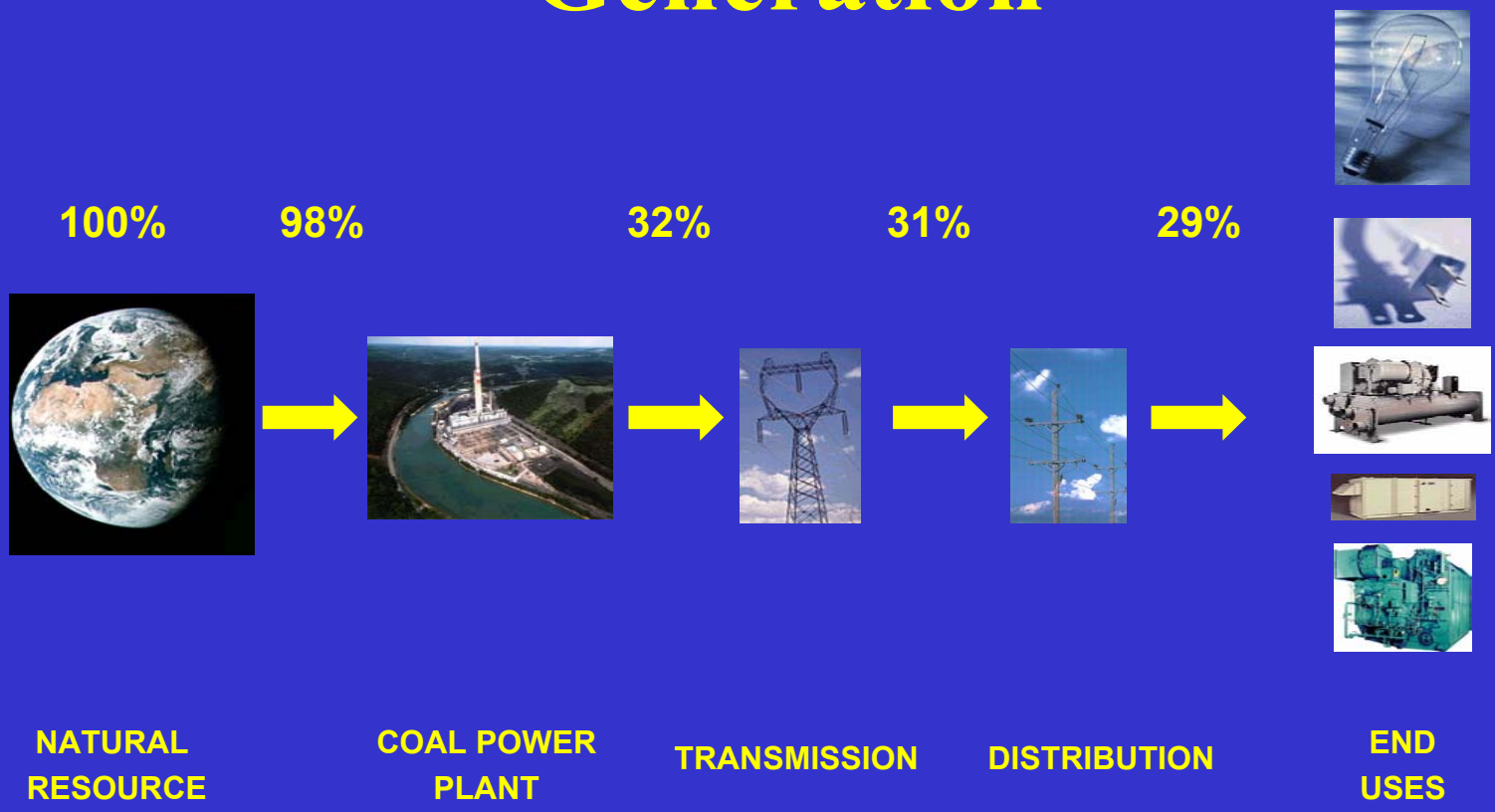
CHP is the Best!

- **Improve reliability**
  - **Eliminate transmission and distribution outages**
  - **National security improvement**
- **Best for environment**
  - **Reduce outdoor emissions**
  - **Improved indoor air quality**

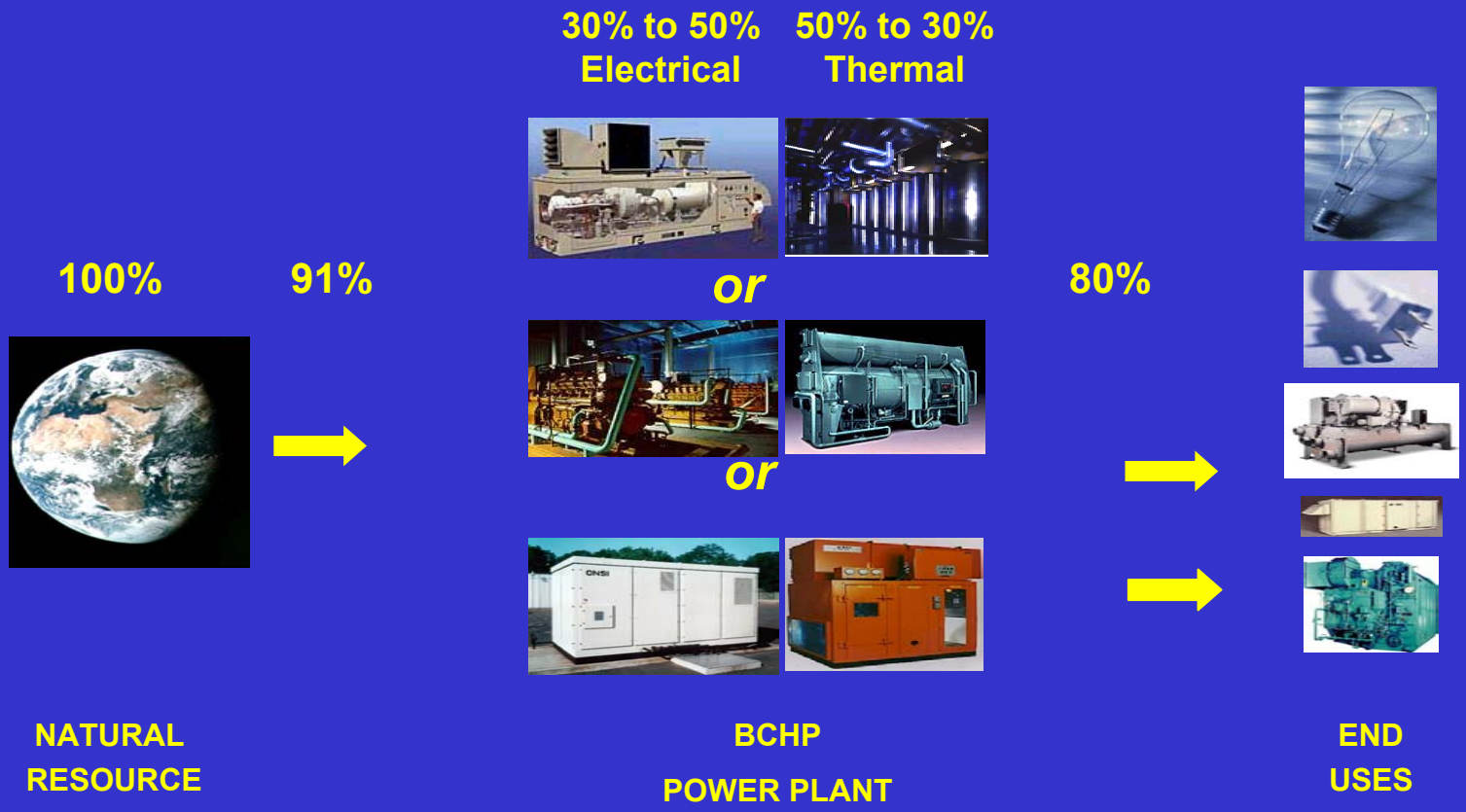
CHP Improved Efficiency

- Status
  - Current remote electric plants – 30% efficient
  - Integrated CHP Systems – 80% efficient
- Key
  - Thermally-activated equipment: use heat rejected from electric generators

Efficiency of Central Power Generation



Delivered Efficiency of CHP




Reaching Consensus
on Roadmap Framework
June 3, 1999


BCHP
INITIATIVE

BCHP INITIATIVE

Airxchange
American Gas Association
American Gas Cooling Center
Argonne National Laboratory
Arthur D Little, Inc.
BOMA
BOCA
Broad U.S.A. LTD
Burt Hill Kosar Rittelmann Associates
Carrier Corporation
Capstone Turbine
Consolidated Edison
Consolidated Engineering Services
Deer Power Systems
Des Champs Laboratories
District School Board of Pasco County
EXERGY Partners Corp.
Federal Energy Management Program
Fresh Air Solutions
GARD Analytics
GRI
Goettl Air Conditioning
Honeywell International
Controls Division
Allied Signal Power Systems Inc.
HVAC Systems, Inc.
Institute for Gas Technology
International District Energy Assoc.
Keyspan Energy
Lehr Associates Consulting Engineers
Lennox Industries Inc.
MC-Power
Mississippi Valley Gas Company
Modine Manufacturing Company
Munters Corporation
National Renewable Energy Lab.
NICOR
NiSource
North East Midwest Institute
NREC
NYSERDA
Oak Ridge National Laboratory
ONSI
OnSite Sycom Energy Corporation
Pacific Northwest Laboratory
Pennsylvania State University
Penton Media
Reliant Energy – Minnegasco
Rotary Power International, Inc.
Sebesta Blomberg & Associates, Inc.
Seimens Westinghouse
SEMCO Inc.
SoCal Gas Company
Solar Turbines
Southwest Gas
Strategic Resource Solutions
Tecogen
TECO
TESS
The Trane Company
Trigen Energy Corporation
University of Illinois
University of Maryland
US Army R&D Center
US Department of Energy
US Environmental Protection Agency
USCHPA
Wärtsilä NSD, North America Inc.
Washington State University
Wrightsoft
York International
ZBA Inc.

OUR GOAL

Make nation's energy generation delivery system the cleanest and most efficient, reliable and affordable in the world.

BCHP ROADMAP

- **VISION**
  - **By the year 2020, Buildings Cooling, Heating and Power (BCHP) will be the preferred method of energy utilization in buildings.**
  - **BCHP will improve the indoor environment, conserve resources and reduce emission rates through energy system integration.**

Thermally Activated Technologies

- Buildings
  - Large commercial
  - Small commercial and residential

- **Unitary equipment consumes over 75% of building HVAC energy**

Thermally ActivatedApplications

- Humidification
- Dehumidification
- Refrigeration
- Space heating
- Water heating
- Space cooling
- **Thermal Storage**

Statistics on Asthma and Allergic Diseases

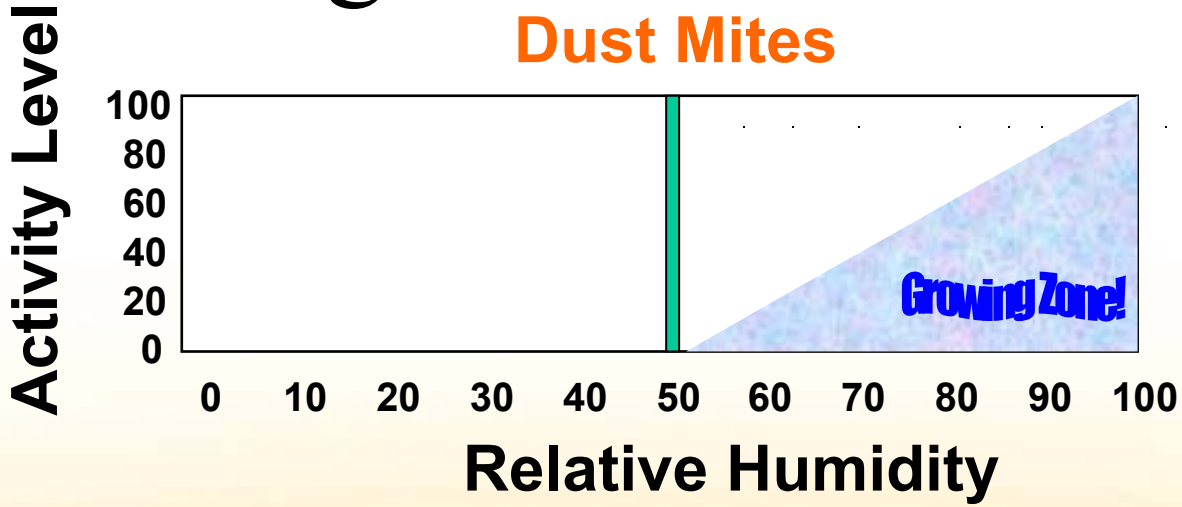
- 17 million Americans have asthma and allergic diseases
  - 4.8 million children
  - 7% expectant mothers
  - Rate on increase
- 31 million Americans develop sinusitis each year
  - 18 million physician visits
  - $8 billion in health expenditures
  - 4 days/year missed work days on average
  - Rate on increase

HEALTHY INDOOR ENVIRONMENT

Causes of Asthma and Sinusitis:

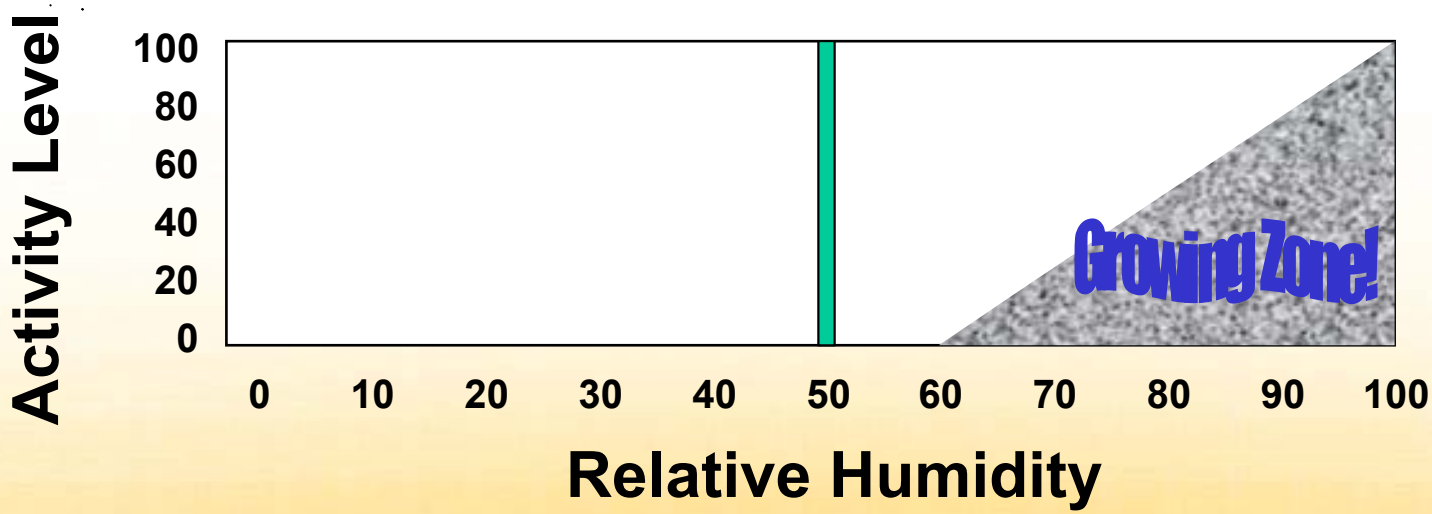
- **Residue from dust mites**, cockroaches and pets
- Tobacco smoke
- **Mold and fungus**
- **Bacteria**
- Pollen and dust

Optimum Relative Humidity for Minimizing Adverse Health Effects

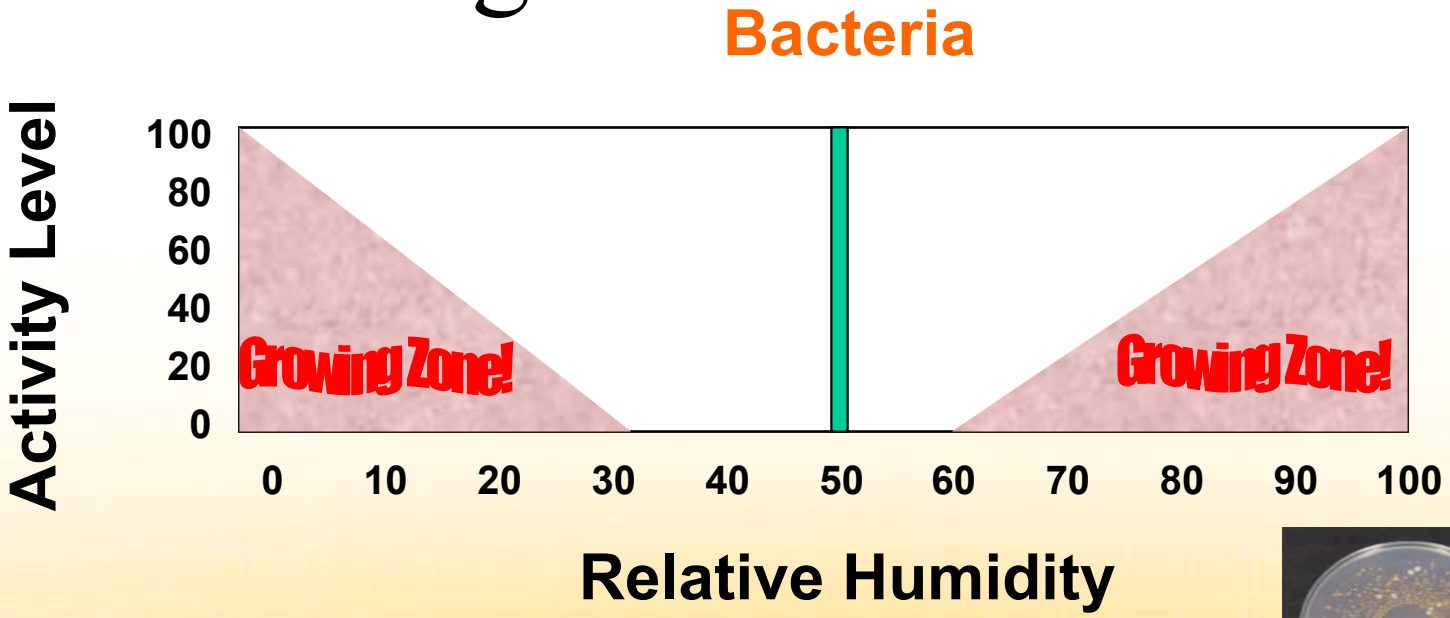


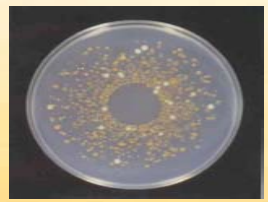
Optimum Relative Humidity for Minimizing Adverse Health Effects

Mold & Mildew



Optimum Relative Humidity for Minimizing Adverse Health Effects





BACTERIA

Residential Desiccant Dehumidifier

Product Development

HEATCRAFT™

gti

TECO PEOPLES GAS

ERC University of Illinois/Chicago Energy Resources Center

The Global Center for Desiccant Technology
Department of Mechanical Engineering
Mississippi State University

Mississippi Valley Gas

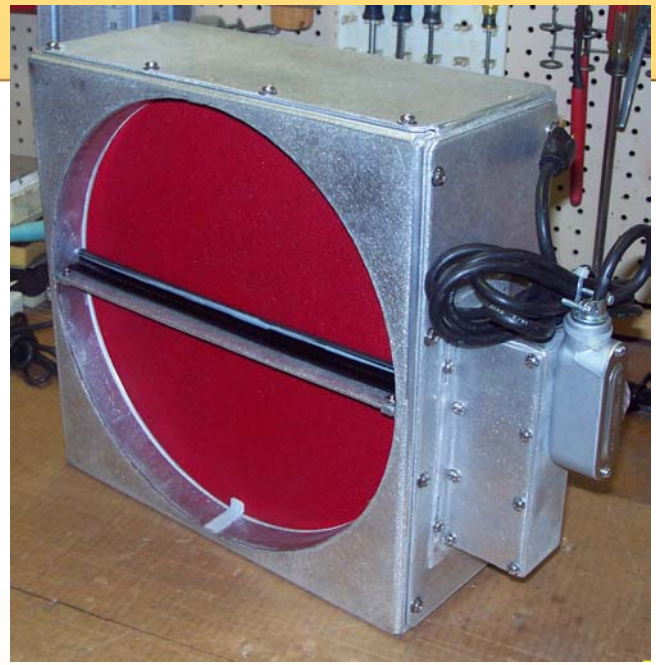
Exergy Partners

NREL National Renewable Energy Laboratory

AMTI

OAK RIDGE NATIONAL LABORATORY

Rotor Cassette



- NREL performance validated
- Munters old design
  - Caster supported rotor design
  - Separate seal
- Redesign
  - Simpler drive assembly
  - Snap together cassette construction

Residential Field Tests

Sensors

1) Outdoor T_{db}

2) Outdoor %RH

3) Indoor T_{db}

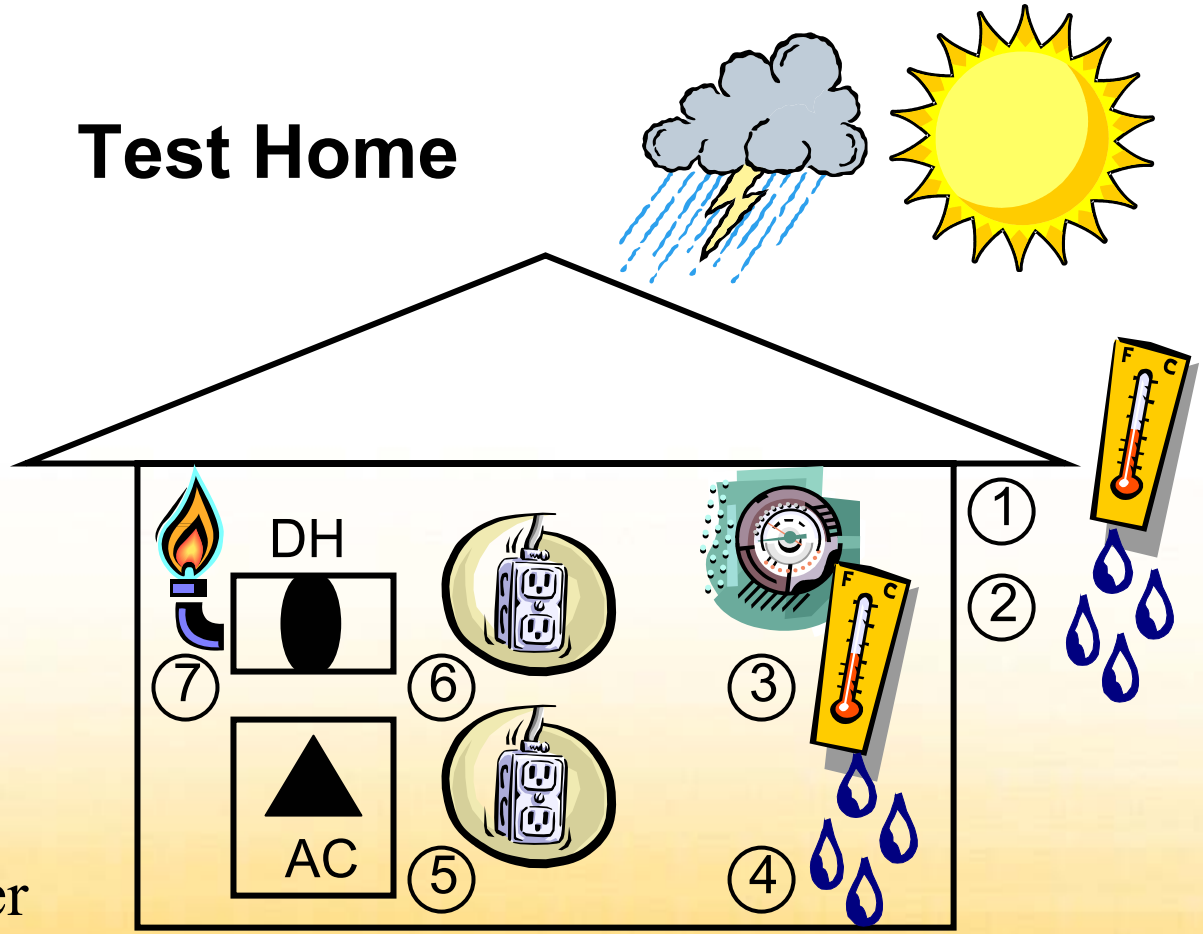
4) Indoor %RH

5) AC Watthours

6) DH Watthours

7) DH Gas CF -- separate utility supplied gas meter also required

Note) A pulse



Rocky Research

Gas-Fired and Heat-Activated Commercial Refrigeration

Solid-Vapor Complex Compound Sorption Technology

The Technology
Solid-Vapor Complex Compour

Rocky Research

- Heat activated cycle
- Stationary shell and tube pressure vessels
- Solid-vapor sorption process using ammonia and a solid complex compound substrate
  - Large ΔT (temperature lift): Single stage to -20ºF suction temp
  - No internal moving parts
  - Minimal electric parasitic

Single-Stage Commercial
Refrigeration Products

Rocky Research

- **Applications:**
  - Frozen meat and vegetable storage (-5°F to +5ºF)
  - Frozen fish and ice cream storage (-5ºF to -20°F)
  - Fresh meat, fish and vegetable storage (38ºF)
- **Markets:**
  - Supermarkets
  - Fast food and chain restaurants
  - Stores and institutional

A New Product Line Based on Advanced Natural Gas Absorption Technology

ambian
CLIMATE TECHNOLOGIES

The Championship Team

- Mississippi Energies
- Southern Natural Gas
- Southern California Gas
- Southwest Gas
- Williams

- Rocky Research
- ITT
- Goettl
- Dectron Internationale
- Distribution/Dealers

&

U.S. Department of Energy

AMBIAN
CLIMATE TECHNOLOGIES

Alpha Central Test Stand

Pre-commercial Product Reliability Testing

AMBIAN
CLIMATE TECHNOLOGIES

The Technology

- High performance heat transfer components
  - **Generator/Absorber Heat Exchanger**
  - **High efficiency vapor separation**
  - **Novel heat transfer surface in absorber**

- Advanced combustion technology
  - **Low emissions**
  - **Variable speed combustion**

AMBIAN
CLIMATE TECHNOLOGIES

Height and Size Reduction from ALPHA to BETA

Thermally Activated Technology

- Dramatically improved energy efficiencies
  - Reduced dependence on foreign oil
  - Reduced air pollution
- High electric reliability and quality
- Healthy indoor environment

Building A Better Tomorrow

BCHP Initiative Brings it all Together - Questions?